4. Fatima

Program Name: Fatima.java **Input File: fatima.dat**

Fatima has been working with nested loops but has encountered a situation she cannot quite solve. She wants to produce heat index charts and has discovered that they are "jagged" as shown in the sample output.

Fatima found the following formula on the Web where ambient air temperature (t) is measured in °F while relative humidity (h) is a percentage and Heat Index is abbreviated HI:

$$HI = -42.379 + 2.04901523t + 10.14333127h - 0.22475541th - 6.83783 \cdot 10^{-3}t^2 - 5.481717 \cdot 10^{-2}h^2 + 1.22874 \cdot 10^{-3}t^2h + 8.5282 \cdot 10^{-4}th^2 - 1.99 \cdot 10^{-6}t^2h^2$$

However, the above formula has some limitations and under certain conditions must be adjusted with an additional calculation. When the calculated heat index is over 140 °F it is considered invalid and should not be displayed. When humidity is greater than 85%, the following adjustment must be added to HI:

ADJUSTMENT = ((h – 85.0) / 10) * ((87.0 – t) / 5.0)

There are some other special situations but they will be ignored for this program.

Can you create a heat index chart program for Fatima?

Input: First line of data file contains a positive integer N, the number of test cases that follow with $1 \leq N \leq 10$. Each test case contains just one line with two floating point numbers separated by a space: step size, A, for the air temp labels across the top of the chart and step size, H, for the humidity labels down the left side of the chart with $1.0 \leq A, H \leq 10.0$.

Output: For each test case, display a heat index chart formatted as shown in the samples. The air temp labels across the top always start with 80.0 and do not exceed 125.0. The line of equal signs below the air temp label line always contains 95 equal signs. The humidity labels on down the left always start with 20.0 and do not exceed 100.0. The final values may be less than maximums depending on step sizes. All values in the chart are displayed with 1 digit after decimal point. After the final line of the chart, display a line containing 30 equal signs "==========".

Sample input:

```
3
5.0 5.0
4.5 7.5
3.0 10
```

~ Sample output on next page ~

Fatima, continued

Sample output:

```
Temp   80.0  85.0  90.0  95.0 100.0 105.0 110.0 115.0 120.0 125.0
Humid ==========================================================================================
 20.0  78.6  82.0  86.3  91.5  97.5 104.3 112.0 120.5 129.9
 25.0  78.9  82.4  87.0  92.7  99.6 107.6 116.8 127.1 138.5
 30.0  79.2  82.9  87.9  94.4 102.3 111.6 122.3 134.5
 35.0  79.5  83.5  89.2  96.5 105.5 116.2 128.6
 40.0  79.9  84.3  90.7  99.0 109.3 121.5 135.7
 45.0  80.3  85.3  92.5 101.9 113.5 127.4
 50.0  80.8  86.5  94.6 105.2 118.3 133.9
 55.0  81.3  87.8  97.0 108.9 123.6
 60.0  81.8  89.3  99.7 113.1 129.5
 65.0  82.4  90.9 102.7 117.6 135.9
 70.0  83.0  92.7 105.9 122.6
 75.0  83.6  94.7 109.5 128.0
 80.0  84.2  96.8 113.3 133.8
 85.0  84.9  99.1 117.5 140.0
 90.0  86.3 101.8 121.6
 95.0  87.8 104.6 126.0
100.0  89.3 107.6 130.7
==============================
Temp   80.0  84.5  89.0  93.5  98.0 102.5 107.0 111.5 116.0 120.5 125.0
Humid ==========================================================================================
 20.0  78.6  81.7  85.4  89.8  95.0 100.8 107.3 114.5 122.3 130.9
 27.5  79.0  82.2  86.4  91.6  97.8 105.1 113.4 122.7 133.1
 35.0  79.5  83.0  87.9  94.1 101.7 110.7 121.0 132.7
 42.5  80.1  84.2  90.0  97.5 106.7 117.6 130.1
 50.0  80.8  85.8  92.8 101.8 112.8 125.8
 57.5  81.5  87.7  96.1 106.9 119.9 135.3
 65.0  82.4  89.9 100.0 112.8 128.2
 72.5  83.3  92.5 104.6 119.6 137.5
 80.0  84.2  95.4 109.7 127.2
 87.5  85.6  98.8 115.3 135.4
 95.0  87.8 102.7 121.4
==============================
Temp   80.0  83.0  86.0  89.0  92.0  95.0  98.0 101.0 104.0 107.0 110.0 113.0 116.0 119.0 122.0 125.0
Humid ==========================================================================================
 20.0  78.6  80.6  82.8  85.4  88.3  91.5  95.0  98.8 102.9 107.3 112.0 117.0 122.3 128.0 133.9
 30.0  79.2  81.2  83.8  86.8  90.4  94.4  99.0 104.1 109.6 115.7 122.3 129.4 137.1
 40.0  79.9  82.3  85.4  89.3  93.8  99.0 104.9 111.5 118.9 126.9 135.7
 50.0  80.8  83.9  87.9  92.8  98.5 105.2 112.8 121.2 130.6
 60.0  81.8  85.9  91.1  97.4 104.7 113.1 122.6 133.1
 70.0  83.0  88.4  95.1 103.0 112.2 122.6 134.3
 80.0  84.2  91.3  99.8 109.7 121.0 133.8
 90.0  86.3  95.1 105.4 117.3 130.8
100.0  89.3  99.7 111.8 125.7
==============================
```